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THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

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BUREAU OF PLANT INDUSTRY

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THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XXII Number 7

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INSPECT STRAWBERRY FIELDS NOW FOR THE RED-STELE ROOT DISEASE

J. B. Demaree and M. F. Bain

Laboratory and field studies show that the Phytophthora[1/] causing the red-stele disease of strawberries is favored by cool temperatures and wet soils. Temperature most suitable for sporangial production ranges between 55° and 70° F. Vegetative growth ceases at about 80°, and 5 degrees higher becomes lethal. Free soil water is necessary for the spread of the zoospores. Sporangia are readily produced when newly infected fibrous roots are submerged in cool water for a period of 12 hours or more, and have been found occurring naturally on roots of plants grown in well watered pots. Therefore, poorly drained soil that holds water for several hours after a rain is essential for the rapid increase of the fungus. At present the indications are that the fungus may persist and spread slightly in a well drained soil, but will not develop in an intensive form.

The fungus remains dormant, presumably in the oospore stage, during the summer months, and new infections start during the autumn and can continue throughout a mild winter. Weather conditions during the past fall and winter were perhaps almost ideal for the development and spread of the fungus in Maryland, Virginia, Delaware, New Jersey, West Virginia, and Pennsylvania. Rainfall was excessive in October, fall temperatures were below normal, and the winter was generally mild.

Inspections made in Maryland and Virginia this spring indicate that the disease will be more destructive than usual. Some fields located on low ground in Maryland were so badly diseased that stunting and dying of plants were evident during the last week in March. The disease in a few entire fields and in the lowest parts of other fields was so far advanced that crop failure is certain. This Phytophthora trouble potentially ranks among the most destructive of all strawberry diseases wherever temperatures and soil conditions are favorable for its development. The fungus can easily be spread by infected plants, and undoubtedly is being introduced to uninfested fields in this manner.

The most obvious symptoms of the red-stele disease are gradual stunting of plants and wilting and dying of the older leaves; the newer leaves of badly infected plants are usually small, on short petioles, and bluish. The root system will show a deficiency of fibrous roots; the fleshy roots may be entirely devoid of rootlets and otherwise healthy in appearance, except that the stele will show red when examined. In the more advanced stages of the disease the fleshy roots die gradually from the tips.

1/ A report of the isolation of this Phytophthora will soon be submitted to Science.

The writers are desirous of receiving reports of the occurrence of the disease in various localities. Reports will be greatly appreciated. Specimens are not desired, unless observers wish to have their identification verified.

(Division of Fruit and Vegetable Crops and Diseases).

NORTHERN TYPE OF STRAWBERRY DWARF SERIOUS ON THE CHESAPEAKE PENINSULA

George M. Darrow and J. B. Demaree

It has been recognized for several years that there are two physiological strains of the strawberry dwarf nematode Aphelenchoides fragariae. One is prevalent in the South and results in dwarfing of the plants during the hottest part of the summer, and the other is known in the Cape Cod district of Massachusetts. The symptoms of the latter appear during the cool early spring and become less evident, or entirely disappear as the season advances.

The writers have suspected for the past year that the northern type of dwarf was present in the Middle Atlantic States. In May 1937, a small area in a Dorsett planting in a Delaware nursery was thought to be infested. In June of the same year, about 5 percent of plants in a commercial field of Catskill in New Jersey showed evidence of infestation. Both of these observations were made too late for definite diagnosis. On March 29, 30, and 31, 1938, many severely infested fields were found at Sanford, Virginia, and in the area around Salisbury, Fruitland, and Pittsville, Maryland. The infestation was heaviest in the Catskill and Howard 17 (Premier) varieties, but was also severe in Dorsett and in one planting said to be Town King (properly Lupton). Ten of 27 fields examined were found to be infested. In one field of Catskill set in 1937 with plants taken from four different sources, infestation was found in plants secured from three of the sources.

Identification of the nematode (Aphelenchoides fragariae) and the disease was verified by J. R. Christie of the Division of Nematology, Bureau of Plant Industry.

The symptoms at the end of March 1938 were (1) killing of plants in the worst infestations, (2) killing of fruit buds in most of the infested plants, and (3) undeveloped, stunted, cupped, glossy, crinkled leaves sometimes slightly bronze-tinted. At the end of May and in June 1937, the affected plants (1) were more vigorous than others, (2) were making runners earlier than unaffected plants, (3) had usually no fruit clusters, and (4) had dark, glossier foliage than unaffected plants.

(Division of Fruit and Vegetable Crops and Diseases).

REPORTS ON DEVELOPMENT OF THE APPLE SCAB FUNGUS

RHODE ISLAND: Week of March 23 - April 1. During the past week weather conditions favored the development of Venturia inaequalis, but in spite of the warm weather and rain little advancement could be noted in the development of the perithecia and asci. The perithecia are small. A few show asci when crushed but no spores could be found.

The apple buds are all swelling and a few are showing the barest green tips. The season appears to be from 14 to 20 days earlier than last year (1937) as judged by the emergence and blooming of several spring-flowering plants.

		Specimens examined		
Place	Date	Perithecia examined	Asci	Ascospores
College orchard, Kingston	March 26	36	2	0
	March 29	27	1	0
	March 31	44	4	0
Miller orchard, Warwick	April 1	37	2	0

(Frank L. Howard, Rhode Island Agricultural Experiment Station, April 2).

Week of April 1 - 7. During the past week weather conditions have been adverse to the development of Venturia inaequalis. Cold nights and cool days slowed down the development of perithecia. The perithecia are small and very hard, but few contain asci.

The apple (and pear) fruit buds are coming fast in spite of the cooler weather. Most are in the silver-tip stage but a few have green-tips out as much as $\frac{1}{4}$ inch.

		Specimens examined		
Place	Date	Perithecia examined	Asci	Ascospores
College orchard, Kingston	April 4	25	1	0
	April 7	39	1	0
Miller orchard, Warwick	April 7	31	2	0

(Frank L. Howard, Rhode Island Agricultural Experiment Station, April 8).

NEW YORK: (From New York State College of Agriculture Departments of Entomology and Plant Pathology Weekly News Letter Concerning Insect Pests and Plant Diseases[1]. April 4 and April 11).

Western New York. McIntosh leaf samples from Albion (Orleans Co.) which were taken as they occurred in the orchard when dried down, gave a fairly good spore discharge. As these leaves were exposed in the field this means that if the leaves become dry there will be considerable spore discharge with the next rain and probable infection since green tissue is already exposed. There were 23 percent of the perithecia with over half of the spores mature, 16 percent with between 10 and 50 percent of the spores mature, 25 percent with 10 or less of the spores mature, and 37 percent with immature spores. (J. M. Hamilton, Geneva, April 1).

A McIntosh leaf sample gathered in a severely scabbed McIntosh orchard at Red Creek, Wayne County, on March 31 was practically identical in development with a sample from the severely scabbed Reddick orchard at Ithaca. In both samples, over half the ascospores were colored in about 60 percent of the perithecia and a similar light discharge of ascospores occurred on trap slides from both samples.

McIntosh samples from orchards where scab was apparently less severe last year show much less advanced development. Limited counts from the Palmer sample of McIntosh leaves from Monroe county and the Harding sample from Albion, Orleans County, indicate a very small percentage of the perithecia contain colored ascospores. These limited observations indicate more difference in the development of the scab fungus on the overwintering leaves of orchards with widely varying amounts of scab infection last year than between orchards in Ithaca and in Wayne county with a similar scab infection last year. (W. D. Mills, Ithaca, April 4).

Hudson Valley. No ascospores have been found as yet with McIntosh in the silver tip stage. (D. H. Palmiter, March 30).

A composite sample of leaves collected from scabby McIntosh orchards in Dutchess County examined April 9, showed the following stage of development.

Fifty percent of the perithecia had no spores formed, 14 percent had colorless spores, 20 percent had less than 10 percent of the asci containing colored spores, 10 percent had from 10 to 25 percent of the asci containing colored spores, and 6 percent had from 25 to 50 percent of the asci containing colored spores. No discharge has been obtained yet but after the leaves dry following the present rain I would expect a light discharge with the next rain. (D. H. Palmiter, April 11).

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[1] In succeeding issues referred to as Weekly News Letter.

Champlain Valley. A sample of McIntosh leaves from the Champlain Valley March 27, was very much retarded in development in comparison with western New York. No deeply colored ascospores were found and hyaline spores were noted in only 2 percent of the perithecia. In 38 percent of perithecia, the asci were well developed, but no spores had been cut out. (W. D. Mills, Ithaca, April 4).

WISCONSIN: On March 15, most of perithecia obtained from overwintered Dudley leaves from an unsprayed orchard at Madison contained no asci. A few showed early stages of ascus formation. On March 28 examination of perithecia from the same orchard showed that the more advanced ones contained a small percentage of asci that bore olivaceous spores. A light discharge of ascospores was obtained when leaves bearing the more advanced perithecia were moistened and placed over an agar plate. The more advanced cluster buds of Dudley were somewhat swollen, but had not broken.

A few asci bearing olivaceous spores were found in perithecia from McIntosh leaves collected at Sturgeon Bay on March 26, but no discharge was obtained when such leaves were moistened and placed over glass slides in a moist chamber. (G. W. Keitt, University of Wisconsin, April 7).

FREEZING INJURY TO FRUIT BUDS AT ITHACA, NEW YORK

L. H. MacDaniels

During the warm days of the last of March fruit buds developed unseasonably. In some orchards McIntosh reached the green tip or early delayed dormant stage, and sweet cherry buds were nearly ready to burst. On the night of April 5 the temperature fell to about 18° F., the exact figure depending on the site of the thermometer. As a result of these conditions some damage to fruit buds resulted.

Peach flower buds in this area had already been killed by the winter low temperatures, except next to the lake. Here little further damage resulted. Sour cherries show a few killed blossoms but not enough to reduce the crop. Sweet cherries show more than half of the blossoms killed or severely injured as indicated by blackened ovaries and water soaked appearance of the anthers. The temperatures of 18 degrees was apparently on the border line for complete killing so that greater or less damage can be expected according to the temperature reached in the orchard.

Damage to apples shows up in two ways. One is the blackening of the ovaries of the individual blossoms. In most buds observed the center

flower of the cluster is damaged most. Nearly all clusters show some live blossoms so that it is not likely that the crop will be seriously affected.

The other type of damage shows up in the easy separation of the skin or epidermis from the ovaries or young fruits. What the effect of this will be is uncertain. Under some conditions such separation has been observed to be healed without serious injury to the crop. Under other conditions such injury has been associated with apparent russetting of the fruits later on. Definite observations of injury of this sort at this stage of bloom are not on record so it is not possible to forecast the results. In any case the results would depend upon subsequent seasonal conditions and possibly upon spraying treatment.

(New York State College of Agriculture, from Weekly News Letter, April 11).

STEM RUST ON WHEAT KERNELS

R. J. Haskell and A. G. Johnson

A carload of wheat shipped from Garfield, Whitman County, Washington, was recently received at Astoria, Oregon, and when inspected, many of the individual kernels showed infection with black stem rust [Puccinia graminis]. The infection was at the hilum or germ end of the kernel and telia usually were present. The variety in this case was Federation, which is especially susceptible. The rusted kernels, however, were not shrunken. The chaff, bits of culms, and other parts of the dockage from the sample also showed many rust pustules. A count of 200 kernels from the cleaned grain sample showed 22 percent of them with distinct telia.

Whitman County is in the southeastern part of the State of Washington, where the summer weather is usually too dry for any heavy damage from stem rust. An examination of Plant Disease Survey records shows, however, that stem rust commonly occurs in this County but is rarely serious. It is understood that during the growing season in 1937 stem rust developed abundantly rather late in the season in the Whitman County area.

The present case is of interest because of the high percentage of kernel infection and because it comes from a region where rust ordinarily is of very little consequence.

(Division of Cooperative Extension, Extension Service, and Division of Cereal Crops and Diseases, Bureau of Plant Industry).

APPLE DISEASES IN PENNSYLVANIA IN 1937, A CORRECTION

R. S. Kirby

In the table summarizing the orchard survey for apple diseases in Pennsylvania in 1937, on page 38 of the February 1 issue, the last subheading "All sprays omitted but one" is an error. The correct heading is "All sprays applied except one". This portion of the table is given below with the correct heading.

Treatments or sprays	Number orchards surveyed	Number apples counted	Percentage of diseased apples								
			Scab	Brooks spot	Sooty blotch	Blotch	Black rot	Bitter rot	Apple rust	Quince rust	Total
All sprays applied except one (the name is of the one spray that was omitted)											
Delayed dormant	26	9,875	5.17	.13	.31	.09	.29	.33	.43	.03	6.27
Pre-pink	23	8,100	14.42	.37	.41	.01	.15	1.3	.20	.28	17.15
Pink	15	2,181	22.38	.27	2.13	.05	.19		.41	.14	25.5
Petal fall	5	1,150	15.75	.61	1.13		.61				18.09
1st cover	6	2,000	10.25	.4	1.05	.05	.1		1.		12.75
2nd cover	11	4,200	3.48	.24	1.		.26	.02	.5	.07	5.58
Last cover	31	11,750	4.03	.93	7.2		.08		.03		13.24

(Pennsylvania State College).

WHEAT DISEASES OBSERVED IN OKLAHOMA

K. Starr Chester

I have been impressed during the past few days with the very large amount of orange leaf rust [Puccinia rubigo-vera tritici] present in many of our winter wheat fields. The wheat is about 9 inches high and is so heavily infected in some fields that they already look yellow and scorched in spite of abundant rainfall. Other fields varied in the severity of the infection. During the past three days we have had an abundance of rain with high, warm winds, and I would anticipate considerable damage by harvest time. My experience here is so limited that I cannot compare this year's infection with that of a normal year.

The affected fields are also suffering in many cases from severe aphis infestation which combines with the rust injury to produce very marked damage. No stem rust has been observed thus far. I was interested to find one field with a generous sprinkling of one of the wheat mosaics. No other wheat diseases are conspicuous as yet; however, I believe that the stage is set for rather severe bunt [Tilletia sp.] losses this year. The greater part of the winter wheat belt in the western part of the State was planted rather late when the temperatures were low enough to favor infection. There was a considerable amount of smutty wheat produced last year, and much of the seed for this year's crop must have been carrying a significant spore load. Dusting has not yet been adopted on a wide scale.

(Oklahoma Agricultural and Mechanical College, April 2).

OBSERVATIONS ON TOBACCO DOWNY MILDEW IN GEORGIA AND THE CAROLINAS

E. E. Clayton

A recent trip (March 20-27) through Georgia, South Carolina, and North Carolina showed the following situation with regard to downy mildew (blue mold) [Peronospora tabacina]:

GEORGIA: Downy mildew has been a little more severe than average, but not nearly as destructive as 1937. Growers generally have plenty of plants to set their acreage on time. Many beds that had not been protected in any way against the disease, however, showed reduction in stand from 20 percent up to practically 100 percent, and surviving plants were delayed as much as three weeks. The extensive spraying campaign conducted under the auspices of the State College Extension Service and the Georgia Coastal Plains Experiment Station provided an excellent opportunity

to study the value of this treatment in the hands of the growers. It was estimated that as many as 50 percent of these used the copper oxide-cottonseed oil spray. A large number of growers were visited on a trip through the major area of the State in company with Messrs. S. B. Fenne and J. G. Gaines. Growers compared their sprayed beds with either an unsprayed bed or with a neighbor's unsprayed bed. We did not find any who did not feel that their spraying had been profitable and all planned to spray again next year. In none of the sprayed beds had stands been appreciably reduced nor had the disease attack delayed their plants seriously. It was too early to check field stands but what we saw looked very satisfactory. It was noticeable that the better growers did the most thorough spraying and obtained best results. Studying spray procedures used, we found that the growers generally had obtained suitable equipment and materials, and had mixed and applied the spray reasonably well. Many, however, had been so impressed with the rate of application - about $2\frac{1}{2}$ gallons per 100 square yards of bed - for small plants that they had continued to use this rate throughout, instead of increasing the amount as plants grew in size. The fact that growers generally got along so well with a treatment entirely new to most of them can only be explained by the very effective educational campaign conducted in this State during the past winter and early spring. More than 150 demonstration meetings were held at which growers were instructed in detail.

SOUTH CAROLINA: The tobacco-growing area of this State has had no general rains since the first of the year and beds, excepting those located in low moist places, have poor stands. Downy mildew had been present some time but has made no general spread.

NORTH CAROLINA: Downy mildew has appeared in the eastern and southeastern areas of this State but there has been no general outbreak. Plant stands are generally good and the plants are larger than usual for this time of year. Temperatures recently have been above normal and moisture subnormal.

In all three States it is to be noted that early predictions regarding heavy carry-over of infection in old plant beds have been fully verified. In Georgia some of these old beds had the plants practically destroyed by the disease early in the year. Mr. J. G. Gaines sprayed old and new beds at several locations, however, and no difference could be observed in the plant stands on old and new sites in these tests. Consequently while the use of old bed sites certainly would not be recommended, it does appear that even with the heavy carry-over of this year, the plants can be saved.

(Division of Tobacco and Plant Nutrition, March 30).

MORE RECENT REPORTS ON TOBACCO DOWNY MILDEW

SOUTH CAROLINA: Downy mildew has become general throughout the State but does not appear to be causing severe damage. (W. M. Lunn, Division of Tobacco and Plant Nutrition).

SOUTHEASTERN NORTH CAROLINA: Downy mildew was general April 6, many beds showing peak development and some already giving indications of recovery. Very few plants were being killed. Unless the situation changes for the worse the majority of these growers will complete their setting during the normal transplanting period for this area. (Luther Shaw, Extension Plant Pathologist).

NORTH-CENTRAL NORTH CAROLINA: Downy mildew was observed in this area two weeks earlier than in 1937. Recent weather has been cool and no general disease outbreak has occurred. The disease was found first in an old bed that was well advanced. (T. E. Smith, North Carolina Agricultural Experiment Station and Division of Tobacco and Plant Nutrition).

BRIEF NOTES ON PLANT DISEASES

PEACH LEAF CURL IN KENTUCKY: Peach leaf curl [Taphrina deformans] is severe except where trees have been sprayed.

Peach trees growing wild along the roadside near an old mill where they have apparently been reseeding for many years appear to be entirely free from curl. This has been true for several years. (W. D. Valleau, Kentucky Agricultural Experiment Station, April 12).

GRAY MOLD ROT OF STORED APPLES IN DELAWARE: Dr. K. J. Kadow writes that gray mold rot (Botrytis sp.) is much more prevalent in Delaware than had been thought. It is being found in practically all stored apples examined, although losses are serious in only a few cases. Dr. T. F. Manns reports about 10 percent loss in one lot of York apples, and about 1 percent in Grimes and Jonathans in another house.

EARLY APPEARANCE OF CROWN RUST ON OATS IN TEXAS: Crown rust [Puccinia coronata] of oats was found on the experimental oats at the Station (Texas Substation No. 6, Denton), today. Only a small amount of infection could be found but it is of special significance as this date of discovery is about a month earlier than usually expected. (I. M. Atkins, Division of Cereal Crops and Diseases, April 4).

SCLEROTINIA STEM ROT OF ALFALFA IN KENTUCKY: Many reports have come in of fall-sown alfalfa injured by Sclerotinia trifoliorum. Stands are being reduced by more than 50 percent in instances observed with small to large areas where all plants are killed. Spring-sown and older alfalfa is only slightly affected. (W. D. Valleau, Kentucy Agricultural Experiment Station, April 12).

LETTUCE ANTHRACNOSE IN CALIFORNIA: In a note accompanying a specimen collected at Salinas by J. B. Kendrick and M. W. Gardner, March 29, Dr. Gardner wrote that anthracnose (Marssonina panattoniana) is of major importance on head lettuce in the Salinas region this year.

MARCH WEATHER

(From Weekly Weather and Crop Bulletin, for the week ending April 5).

March was abnormally warm and wet. So uniformly high temperatures and above-normal precipitation in March have rarely been duplicated in recent years.

Figure 1 shows that the month was very warm throughout the central valleys and the northern Great Plains, where the mean temperatures ranged from 8° to 13° above the seasonal normal. In most other sections from the Rocky Mountains eastward to the Atlantic coast the monthly means varied from 5° to 7° above normal, while the only subnormal temperatures reported were in Central Pacific States and the western Great Basin, where they were from 2° to 3° below the average.

Figure 2 shows that precipitation for the month was above normal practically everywhere from the Appalachian Mountains westward, except in some north-central districts. The month was unusually wet in the Ohio Valley and the lower Great Plains, where the totals ranged from 150 to over 300 percent of the normal; throughout the latter area totals were generally over 150 percent, with local sections ranging well over 200 percent. In the Pacific Coast States and some adjoining sections to the eastward the month had from 2 to 3 times its normal rainfall, while locally in the upper Great Basin the amounts were also over 200 percent.

Subnormal precipitation was reported from the Gulf and Atlantic coasts, the amounts being particularly deficient in portions of the Carolinas and along the central Gulf coast. Local areas elsewhere were slightly subnormal, the most extensive regions being portions of the northern Great Plains and from western Iowa northward, as well as in northern New Mexico.

FREEZING INJURY TO FRUIT CROPS IN APRIL

(From Weekly Weather and Crop Bulletin, for the week ending April 12).

Frosts were quite general during the week, extending as far south as central portions of most Gulf States, and subfreezing weather was noted southward to northern Georgia, and to Oklahoma and western Texas. While

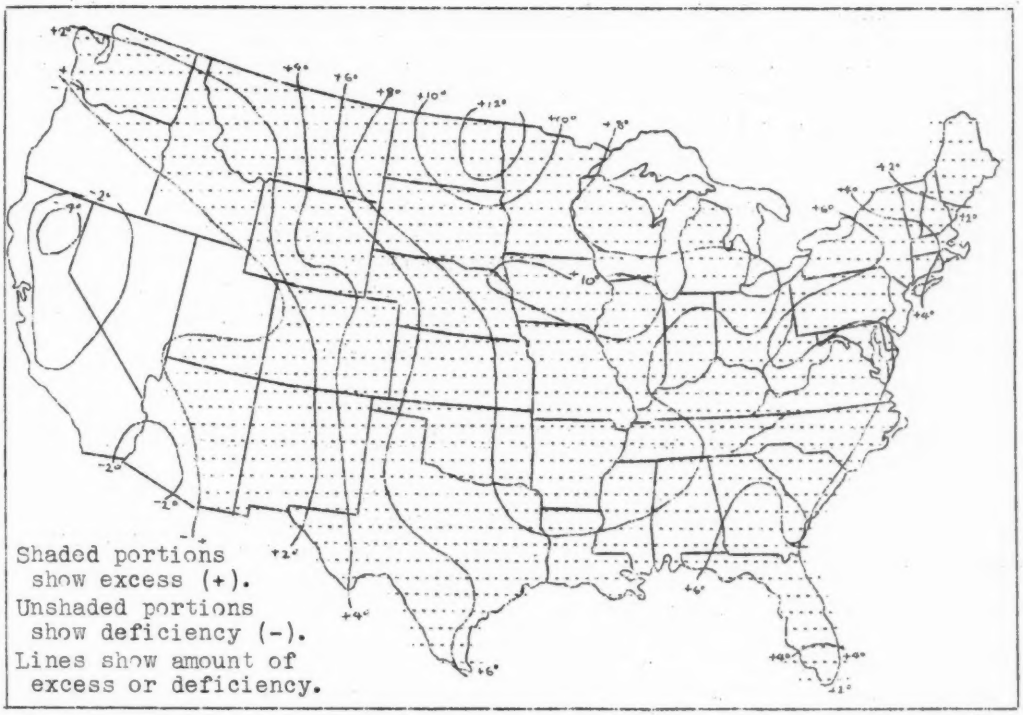

Fig. 1. Departure of Mean Temperature from the Normal for March 1938.

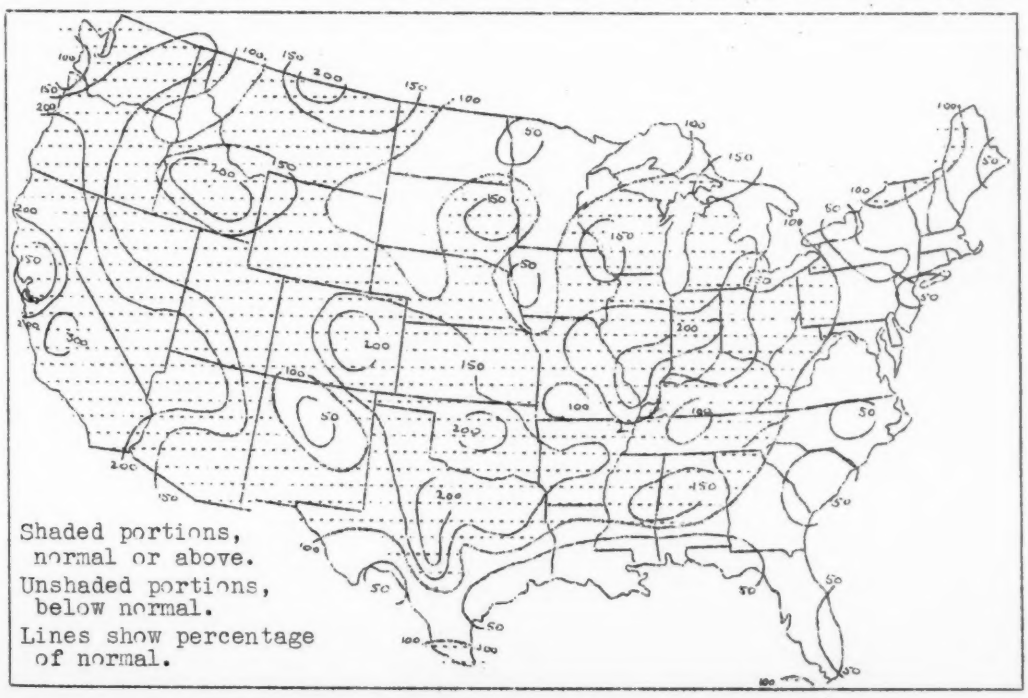

Fig. 2. Percentage of Normal Precipitation for March 1938.

it is too early to obtain a reliable determination of the amount of injury caused by the cold weather, present indications are that considerable early fruit was damaged in many places from the Ohio Valley southward and southwestward. Serious damage was indicated in the mountain sections of the Carolinas, as well as in portions of Virginia and West Virginia.

In the Ohio Valley and adjacent sections there appears to be considerable injury to early peaches, plums, and cherries, and serious harm was reported to these crops in Missouri; fruit was believed killed over much of Oklahoma, while considerable damage was noted in Kansas. Freezing caused heavy damage to sour cherries in southern Michigan, but other fruits were believed to have escaped with but little harm.

LITERATURE NOTE: AERIAL DISSEMINATION OF ONION DOWNY MILDEW

The article by A. G. Newhall in the current number of Phytopathology (The spread of onion mildew by wind-borne conidia of Peronospora destructor. Phytopath. 28: 257-269. April 1938) is of interest from the standpoint of the dissemination and control of onion downy mildew and possibly of downy mildews of other hosts as well.

The author states that the fungus overwinters in plantings of the perennial topset and multiplier onions, that circumstances of its spread to commercial fields in 1937 could only be explained by wind-carrying of the conidia, that conidia that proved to be viable in germination tests were caught at elevations up to 1,500 feet, and that the conidia were found to "remain viable for several days at temperatures and humidities that often prevail in the spring for many days in the Northeastern States."

He reports also that results of his tests on the relative toxicity of malachite green and copper sulphate to downy mildew spores agree with those of McWhorter and Pryor (Reporter 21: 306-307). The implication of his article, however, is that for onion downy mildew eradication of the perennial sources of infection, which he says are much more commonly planted in the East than has been thought, offers a much more promising method of control than spraying even if better fungicides are developed and is in any case the most pressing problem at present.